



NASA Langley's Optical Remote Sensing Technologies

Improved methods to monitor pollution
and toxic gases

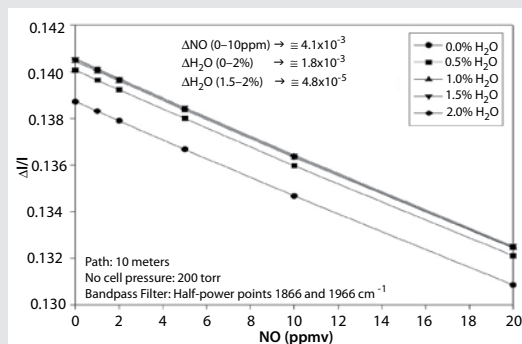
NASA Langley has developed a strong capability and patent portfolio in the field of optical remote sensing of gases. In particular, these technologies focus on improved optical sensor systems, methods of balancing detector output and performing nonmechanical optical path switching, and methods to linearize nonlinear measurements in detector systems. Langley has created numerous techniques and advanced field-ready prototypes to perform a variety of measurements, including auto emissions monitoring, methane leak detection, and pollution monitoring. The Langley remote sensing technology portfolio enables highly accurate real-time sensing of multiple trace gases in the atmosphere. The market for remote gas sensing is growing as health and safety considerations drive both government and industrial sectors to increase monitoring of polluting and toxic gases. NASA is seeking a partner for the continued commercialization of these technologies.

Benefits

- Simultaneous, independent measurement of multiple gases (e.g., methane, carbon monoxide, carbon dioxide, ethane, nitrous oxide, and sulfur dioxide)
- Ability to differentiate between gases that have overlapping absorption spectra
- Reduced measurement errors and balancing requirements
- High sensitivity for active sensing – 500 ppb-meter for methane, 50 ppb-meter for carbon monoxide
- High sensitivity for passive sensing – 10 ppm-meter methane
- Low-maintenance systems due to nonmechanical optical path switching
- Open path optical monitoring that is highly sensitive to transient gas concentrations
- No gas correlation cells required by differential absorption radiometers
- Ability to construct 2D maps by rastering the sensor's field

partnership opportunity





Calculated differential absorption GFCR response ($\Delta I/I$) versus NO concentration for four water vapor concentrations

Applications

The technology offers wide-ranging market applications, including:

- Methane and pipeline leak detection
- Fence-line monitoring of fugitive emissions
- Plume and emissions detection/monitoring
- Chemical detection/monitoring (breath analysis)
- Optical measurement/analysis of a multitude of gases in atmosphere or confined systems

The Technology

NASA Langley has developed an extensive portfolio of technologies for satellite remote sensing of the atmosphere. The same NASA Langley technology has been demonstrated for use in the following remote sensing applications:

Automobile emissions monitoring

- Demonstrated cross-road, open-path Gas-Filter Correlation Radiometry (GFCR) for measuring the emissions of passing automobiles or for specific gases. The GFCR sensor enables the measurement of multiple gases at very high rates and sensitivities.

Methane leak detection

- Langley's innovative nonmechanical path switching GFCR portfolio has a strong capability for methane leak detection. In particular, these technologies allow high-speed airborne, passive monitoring of methane pipelines, which is currently not available.

Pollution/fugitive emissions monitoring

- Langley's portfolio of technologies can offer a very high-rate, high-sensitivity multi-gas sensor for remote pollution/fugitive gas monitoring. These technologies are ideal for high accuracy remote airborne and fence-line monitoring of facilities and perimeters where high measurement counts in a target area are required.

The remote sensing technology portfolio includes U.S. Patents 6,922,242; 6,611,329; 6,057,923; 6,008,929; 6,574,031; and 5,128,797.

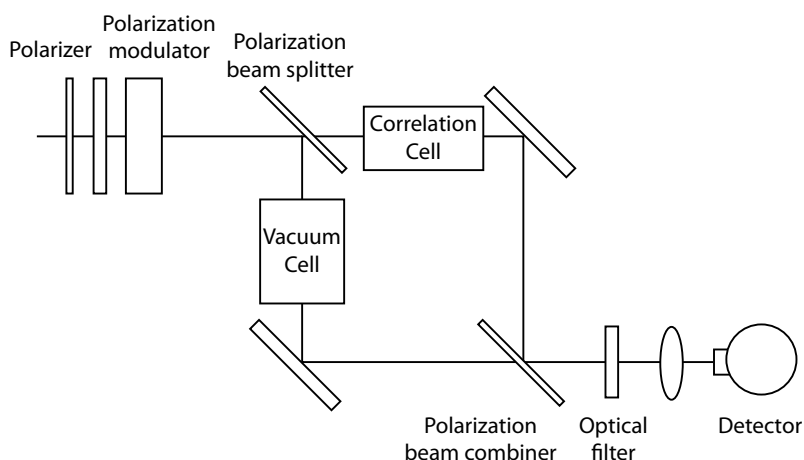


Diagram of the polarization-modulated GFCR in which incoming radiation is switched rapidly and nonmechanically between the vacuum and correlation cell paths

For More Information

If your company is interested in licensing or joint development opportunities associated with this technology, or if you would like additional information on partnering with NASA, please contact:

The Technology Gateway

National Aeronautics and Space Administration

Langley Research Center

Mail Stop 218

Hampton, VA 23681

757.864.1178

LARC-DL-technologygateway@nasa.gov

technologygateway.nasa.gov

www.nasa.gov

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